4.0 Cumulative and Unavoidable Impacts and Irretrievable Commitments, Regulatory Restrictions Analysis, and Comparison of Alternatives

This chapter describes expected

- Cumulative impacts of the proposed Project and alternatives when combined with past, present, and related future actions
- Unavoidable adverse impacts
- Irreversible and irretrievable commitments of resources
- Short-term use versus long-term productivity
- Regulatory impacts on the applicant's private property rights.

4.1 Cumulative Impacts

The Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of NEPA define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). The regulations further explain that "cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

MEPA defines cumulative impacts as "the collective impacts on the human environment of the proposed action when considered in conjunction with other past, present, and future actions related to the proposed action by location or generic type" (75-1-220(3)). Related future actions may only be considered when these actions are under concurrent consideration by any agency through preimpact statement studies, separate impact statement evaluations, or permit processing procedures (75-1-208(11)).

Analysis of cumulative environmental impacts of a proposed Project and other actions helps to ensure that agency decisions consider the full range of consequences of the agencies' actions to the extent information is available.

Cumulative Impacts Region of Influence

The geographical extent of the analysis area was selected for each resource based on the extent and duration of anticipated effects caused by an action. The cumulative impacts region of influence includes all areas in which planned or expected actions might occur.

Cumulative impacts are identified only where there is a reasonable likelihood that the proposed Project would have a cumulative or incremental effect with other past, present, and reasonably foreseeable. Resources that are likely to experience cumulative impacts in addition to direct and indirect impacts from the action alternatives are: land use, water, wetlands, vegetation, wildlife, air quality, noise, socioeconomic resources, cultural resources, and visual resources. The effects of future actions can be hard to predict, so the cumulative impacts analysis is qualitative rather than quantitative.

Past and Present Actions Potentially Contributing to Cumulative Impacts

The Project study area and vicinity are transected by at least 17 pipelines and 8 transmission lines. Sources of information for linear facilities that transect the study area are: 2005 air photos, field observations, and U.S. Geological Survey topographic maps at a scale of 1:24,000. Existing pipelines in the study area are described in Section 3.3. Existing transmission lines that transect the study area are:

- NWE 100-kV transmission line that runs southwest from Great Falls
- NWE 100-kV transmission line that runs south from Great Falls
- NWE 115-kV transmission line that roughly parallels the route proposed under Alternative 3.
- NWE 161-kV transmission line that runs northeast from Great Falls
- WAPA 115-kV transmission line that runs east-west through Shelby and Cut Bank
- WAPA 161-kV transmission line that runs from Great Falls to Havre
- WAPA 230-kV transmission line that runs between Shelby and Great Falls
- PPL 100-kV transmission lines that connect hydroelectric developments to the Great Falls 230-kV switch yard

Other present and past actions in the vicinity of the proposed Project include ongoing uses such as farming (irrigated and non-irrigated), grazing, weed management, hunting, cities and towns, residential areas, industrial and commercial areas, federal and state highways and county roads, railroads and railroad rights of way, communication facilities, military installations, conservation easements, airports, general recreation, and national trails.

Related Future Actions Potentially Contributing to Cumulative Impacts

Related future actions that could occur in the Project study area include the development of wind farms, a hybrid energy project (wind and biodiesel), a new coal-fired power plant, development of irrigation systems, and the construction of new pipelines delivering petroleum products from Canada to markets within the U.S. Related future actions in the region of the Project area are described in detail in Section 2.6 and summarized below.

- The potential to upgrade the capacity of the MATL proposed transmission line to 400 MW in each direction
- Potential development of a trading system for firm and non-firm capacity for the MATL line. The result would be that generators that ship on the MATL line would have the ability to sell unused capacity to a secondary market during periods when they can not use their full capacity.
- Various planned wind energy projects that would likely be implemented if the MATL line was constructed (**Table 2.6-1**).
- Coal-fired Highwood Generation Station – Southern Montana Electric

Impacts from potential wind farms have been addressed in a general sense in the *Final Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States* (BLM 2005). Several potential wind farms that would ship power on the proposed MATL transmission line are in early development stages. Activities that could impact resources from increased wind energy generation are identified in the Wind Energy Programmatic EIS and repeated in the section. Impacts from the proposed Highwood Generation Station are described in the final EIS for that project (USDA Rural Utilities Service and DEQ 2007). Impacts of pipeline construction would be similar to those described in the final EIS for Express Pipeline (BLM and DEQ 1996).

Land Use and Infrastructure

Existing transmission lines, oil and gas well access, pipelines, and roads have affected and would continue to affect land uses within the analysis area. Additional wind farms with associated roads and power lines are anticipated due to MATL and other transmission lines. Depending on their location, these activities may affect farming operations, remove farmland from production, increase traffic on roads and highways, and pose additional hazards to aircraft. Construction related disruption of existing land uses would be short term and result from construction of wind farms and associated access roads and power lines; pipelines and associated pump stations and power lines; and the proposed Highwood Generating Station and associated railroad spur and interconnecting transmission lines. Follow-up power line and pipeline maintenance using standard equipment would be an infrequent occurrence and not add greatly to the existing traffic loads on the roadway network. Each additional elevated structure or set of structures with wires within a given airspace would be a cumulative element for pilots to avoid and would result in a cumulative impact.

Geology and Soils

Cumulative impacts on geology and soils may result from the construction and operation of future wind farms and pipelines within the project study area, construction of new roads, and the increase and need for new or expanded sand, gravel, and

concrete operations in the area. Most wind energy projects include best management practices to mitigate impacts from blasting, excavation, earthmoving, and other construction activities (BLM 2005), and these adverse cumulative impacts are likely to be minor, indirect, and short term. Any cumulative impacts that might occur would be minimal and largely limited to the areas actually disturbed.

EMF

If the line capacity is increased to 400 MW in each direction, the electric field at the edge of the right of way would increase and the mean magnetic field would also be higher based on the increased wattage.

Water Resources

Past and present actions potentially affecting water resources in the vicinity of the analysis area are: ongoing weed management, fertilization, crop production, grazing, road use and maintenance, and waterway modifications for stock watering. These activities can result in surface water flow alterations, water diversions, and stream bank modification and destabilization. Weed control and fertilization can introduce pesticides and nitrates and total dissolved solids to water supplies. Irrigation and waterway modifications for stock can result in increased salinity and flow reduction due to stream channel obstructions and diversions, and saline seep. Some grazing practices result in sedimentation to surface water due to soil destabilization from reduced vegetation. Road maintenance and use at river and stream crossings can destabilize banks and increase sedimentation to surface water.

DEQ has determined that seven water bodies in the analysis area have impaired or threatened beneficial uses by one or more of the activities described above: Missouri River, Benton Lake, Lake Creek, Teton River, Pondera Coulee, Cut Bank Creek, and Old Maids Coulee. These water bodies and their impairment causes and sources are described in Section 3.5 under water resources and in **Appendix I**. Of these water bodies, the Teton River and Pondera Coulee would be crossed by all action alternatives. The Teton River is classified as Category 4A: "all TMDLs (total maximum daily loads) needed to rectify all identified threats or impairments have been completed and approved but impaired beneficial uses have not yet achieved fully supporting status." Pondera Coulee is classified as Category 5: "one or more applicable beneficial uses have been assessed as being impaired or threatened and a TMDL is required." The effects of present and past actions in the analysis area, when added to potential adverse impacts from the action alternatives, would cumulatively present an increased risk of impairment of one or more beneficial uses. This would be a minor long-term adverse cumulative impact to water resources.

Related future actions include the construction and operation of future wind farms and pipelines in response to the availability of increased transmission capability within the project study area. Activities that could impact water resources from increased wind energy generation are identified in the Wind Energy Programmatic EIS as occurring primarily during construction and include:

- Potential reduction in existing water supply sources due to withdrawals during construction
- Increased soil erosion due to ground disturbing activities such as heavy equipment traffic and extraction of geologic materials from borrow areas or quarries.
- Wastewater discharges
- Pesticide application
- Diversion of surface water flows by access road systems, storm water control systems, or excavation activities
- Construction activity alteration of interaction between surface water bodies and local groundwater in systems where the two resources are hydrologically connected.

These activities when combined with the proposed Project or alternatives would cumulatively increase the risk of introducing sediment and other pollutants to water resources in the analysis area and potentially affect the quantity and quality of available water supplies. Construction of these projects would likely cause increased stormwater runoff and potential soil erosion that may carry sediments to surface waters. Because the action alternatives for the MATL Project and projects that might be permitted through the Wind Energy Programmatic EIS would include implementation of mitigation measures to reduce risk of sedimentation, employ proper pesticide application procedures, and comply with waste water discharge requirements, these adverse cumulative impacts are likely to be minor and short term.

Wetlands

Cumulative impacts on wetlands may result from the construction and operation of future wind farms, pipelines, and the Highwood Generation Station within the Project study area. In particular, the area around Cut Bank has good wind power generation potential and also a high concentration of semi-permanent and seasonal wetlands (often referred to as prairie potholes) that provide important habitat for many birds and small mammals. The Benton Lake NWR, located in the southern portion of the Project area, contains the combination of wetlands and grasslands that is important to the management of many waterfowl and wildlife species.

Impacts to wetlands from potential wind farms have been addressed in a general sense in the BLM Wind Energy Programmatic EIS (BLM 2005). Activities that could impact wetlands would occur primarily during construction. The potential impacts would be:

- Habitat disturbance
- Direct injury or mortality
- Erosion and runoff
- Exposure to contaminants
- Facility construction activities

Because the action alternatives for the MATL Project, future wind farms, and the Highwood Generation Station would typically include mitigation measures to reduce disturbance to wetlands, these adverse cumulative impacts are likely to be minor, indirect, and short term.

Native Vegetation

Most of the native vegetation communities in the alignments have been converted to farmland. In some areas, native vegetation is still present and subject to grazing pressure, which may change community structure and composition, in addition to providing disturbed areas for weedy species establishment. Past development of pipelines, oil wells, and access roads to these structures has further reduced native vegetation communities. It is highly likely that more native communities would be disturbed or reduced as wind farms, irrigation systems, or petroleum pipelines are developed in the region. Depending on reclamation practices, impacts to native vegetation can be reduced.

Wildlife

Past activities that have impacted wildlife resources within the analysis area include: loss of native grassland habitat due to agricultural development, loss of wetland habitat due to drainage for agriculture, and minor loss in habitat and disturbance related to oil and gas development and construction of associated pipelines. These activities have resulted in some displacement of wildlife due to habitat loss; however, many of the wildlife species have been able to adapt to habitat conversions and have not been negatively impacted. Species that have experienced the greatest impacts are those species dependent on native grassland habitats, such as grassland dependent birds that have experienced a loss of nesting habitat. Present activities within the analysis area are very similar to activities of the past. Agriculture is the predominant use of land; however, grassland and wetland conversion to agricultural lands no longer occurs at a high rate. Land use within the region is relatively stable and land use practices do not generally negatively impact wildlife.

Related future actions, described in Section 2.7, would result in disturbance and displacement of wildlife during the construction phase, followed by some permanent loss of habitat. Wind farms could have an impact on avian species due to displacement

from habitats and collisions though these impacts may be reduced with sound siting practices.

The MATL transmission line would contribute to habitat loss and potentially increase avian mortality due to collisions. The cumulative impacts of the habitat loss would not likely reduce the viability of wildlife populations within the region, as structures would reduce habitat by a relatively small amount and would not likely consume critical habitats such as large expanses of grasslands or riparian areas.

The Highwood Generation Station would impact wildlife and other biological resources by temporarily displacing wildlife due to removal of vegetation and disturbance from construction equipment. The Highwood Generation Station and wind turbines would result on long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on access roads. There is some potential for increased mortality to birds and bats from blade strikes.

Threatened, Endangered, and Special Status Species

Cumulative impacts to vegetation and wildlife special status species would not differ from those effects discussed within the Wildlife and Native Vegetation sections above.

Air Quality

Past and present actions potentially affecting air resources in the vicinity of the analysis area are: petroleum refining plant (MRC refinery), crude oil and natural gas compressor stations, petroleum product terminals, coal-fired electrical generating plants, concrete mix plants, asphalt mix plants, crematoriums, gravel crushers and associated processing equipment, fugitive dust and smoke sources from farming, field and forest burning, and dust from gravel roads. These sources may affect air quality within the general area of the activity and, possibly, the air shed, depending on the duration and nature of the emission. For emission sources such as construction activities, burning, and road dust the effects are anticipated to be temporary in duration. For emission sources such as refineries, power generating plants, and crematoriums, the impacts would be regulated through permits by DEQ. In general, these activities, when occurring at the same time as, and in the vicinity of, MATL construction activities, are anticipated to have minor adverse cumulative impacts.

The potential impacts of future wind farm developments have been generally addressed in the BLM Wind Energy Programmatic EIS (BLM 2005). Impacts to air resources are anticipated to be temporary. Fugitive gaseous and particulate emissions from construction and operation and maintenance would stop or decrease once these activities are completed. These activities, when combined with the proposed Project or alternatives, would cumulatively increase the risk of affecting air quality in the study

area. Given that mitigation measures such as dust suppression for fugitive emissions, would be implemented, and stationary sources would need to comply with emission standards set by DEQ, these cumulative impacts are anticipated to be minor and short term.

Noise

Noise would be cumulatively affected by the proposed action and the development of wind generation activities. Noise contributed by wind generators could affect nearby residences if the turbines are operated at a wind speed less than about 23 miles per hour (BLM 2005). Cumulative impact from wind turbine noise and the transmission line under Alternative 2 depend on proximity to residences.

Noise contributed by planned wind development would be generated by construction and maintenance activities and generator operations. Construction activities would be similar to those proposed under MATL with the addition of potential blasting. During operation, major noise sources would be aerodynamic noise, transformer and switchgear noise from substations, corona noise from transmission lines, vehicular traffic noise, including commuter and visitor and material delivery, and noise from an operation and maintenance facility, if present. Overall, noise levels of continuous site operation would be lower than the noise levels associated with short-term construction activities (BLM 2005).

At a wind speed of about 48 miles per hour, wind-generated noise is higher than aerodynamic noise. Noise from wind turbines would be more noticeable at lower wind speeds (BLM 2005).

Socioeconomic

The proposed Project and action alternatives would be constructed in an area with major wind generation potential. Implementation of the proposed Project would provide the transmission capacity needed by wind generation projects to access the energy market. At the time of this analysis, up to four wind energy generation projects are likely to occur in the foreseeable future. For instance, Great Plains Wind and Energy, Inc. indicated plans to construct a 45 to 60-turbine wind farm that would straddle the border between Toole and Glacier counties. The Great Plains project could reportedly add $15 million to the two counties' tax base over the next 20 years. During the construction phase, the Great Plains project is estimated to require 250 workers, most of whom would be hired locally. When completed, the project would continue to provide 5 to 15 full-time jobs (Simonetti 2006). Details of other potential projects were not available, but would likely result in similar economic benefits to the region. Case studies of three other wind generation projects occurring elsewhere in the nation indicate economic benefits may vary widely from project to project. For instance, the

construction phase of a wind generation project may generate up to 100 jobs while the operation and maintenance phase may provide between 6 and 31 permanent jobs and between $103,000 and nearly $1 million dollars in additional annual personal income. Wind projects also provide additional landowner revenue in the form of lease payments. Assuming that these types of projects cause little or no increase in government or school budgets, tax payments made by project owners may have the additional benefit of reducing the local tax burden for other local tax payers (Northwest Economic Associates 2003).

Visuals

All action alternatives when combined with past and present (existing transmission lines) actions and actions reasonably expected to occur (wind energy development projects and the Highwood Generating Plant), would increase the adverse impact to the aesthetic quality of the landscape for the long term. Wind generation facilities would be expected to be highly visible because of the introduction of turbines into typically rural or natural landscapes, which have few other comparable structures. In regions with variable terrain, wind developments along ridgelines would be most visible.

A summary of cumulative impacts for the action alternatives is presented in **Table 4.1-1**. **Table 4.1-1** describes impacts for Alternative 2 as proposed by the applicant with the addition of environmental specifications (**Appendix F**).

4.2 Unavoidable Adverse Impacts

This section summarizes the adverse effects that cannot be mitigated that are expected to occur with implementation of the action alternatives.

Unavoidable short-term adverse impacts would be expected to occur to wetlands, land use, visuals, and native vegetation. Long-term unavoidable adverse impacts would occur to land use, birds, and visuals. Construction and operation activities could have adverse impacts on wetland resources from the alteration of surface water drainage patterns, disturbances and trampling of vegetation during construction, and from an increase in sedimentation to localized wetland areas from disturbances on adjacent properties. Transmission line structures would not be placed in wetland areas, so no long-term impacts are expected for wetland resources. Native vegetation would be unavoidably disturbed and weed infestations may occur for the short term during construction and before reclamation. Use of travel routes could be unavoidably obstructed during construction. Long-term impacts to land use include loss of production of farmland, increased risk to aircraft, and interference with farming activities. An increase in avian mortality would be unavoidable and long term. Visual resources would experience unavoidable major adverse impacts to the aesthetic quality of the landscape by transmission lines.

TABLE 4.1-1
CUMULATIVE IMPACTS FROM PAST, PRESENT, AND FUTURE ACTIONS AND ALL ACTION ALTERNATIVES

Resource	Direct and Indirect Impacts From Action Alternatives	Past and Present Actions that Affect the Resource	Reasonably Forseeable Future Actions That Could Affect the Resource	Cumulative Impacts
Land Use & Infrastructure	Loss of production due to structures & roads, increased risk of weed introduction and spread, risk of equipment damage from hitting a structure, increased time to farm around poles, and some GPS-guided equipment may be affected. Cropland crossings also increase the risk of crop duster accidents. During construction, facility construction traffic may conflict with movement of farm equipment on roads. Alt 3 would disturb the least amount of land. Alt 4 would disturb the most. Alt 4 crosses the least total cropland and diagonally. Alt 3 crosses the most cropland. Alt 4 would result in the fewest acres of cropland removed from production due to poles. Alt 4 requires the use of monopoles for crossing all cropland.	Existing constructed network of pipelines and transmission lines. Ongoing farming, grazing, weed management, hunting, cities and towns, residential areas, industrial and commercial areas. Use and maintenance of federal and state highways and county roads, railroads and railroad rights of way, communication facilities, military installations, conservation easements, airports, general recreation, and national trails.	The Highwood Generation Station and various planned wind energy projects would likely be implemented if the MATL line was constructed.	Depending on the location of additional wind farms, combined with oil and gas well access roads and other transmission lines, these activities may affect farming, remove farmland from production, increase traffic on roads and highways, and pose additional hazards to aircraft. The impacts during construction would be primarily short term and of minor magnitude. Other long-term cumulative impacts would be from impacts of farming around structures located in cropped fields. Follow-up power line maintenance using standard equipment would be an infrequent occurrence and not add greatly to the existing traffic loads on the roadway network. Each additional elevated structure or set of structures with wires within a given airspace would be a cumulative element for pilots to avoid and would result in a cumulative impact.

TABLE 4.1-1 (Continued)
CUMULATIVE IMPACTS FROM PAST, PRESENT, AND FUTURE ACTIONS AND ALL ACTION ALTERNATIVES

Resource	Direct and Indirect Impacts From Action Alternatives	Past and Present Actions that Affect the Resource	Reasonably Foreseeable Future Actions That Could Affect the Resource	Cumulative Impacts
Geology & Soils	Risk of mass movement, soil compaction, mixing of soil horizons, and soil erosion. Alternative 4 poses the highest risk of mass movement and soil erosion. Alternative 3 has the least risk of mass movement. Alternative 2 has the least risk of soil erosion. Soil compaction and mixing are expected to be proportional to the length of the alternative.	Grazing, road maintenance.	The Highwood Generation Station and various planned wind energy projects would likely be implemented if the MATL line was constructed. Related new or expanded sand, gravel, and concrete operations in the area.	Same as direct and indirect impacts.
Engineering & Hazardous Mat.	None	Maintenance of federal and state highways and county roads, railroads. Use of farm machinery around poles. Potential contamination from refueling and servicing farming and construction equipment.	Ash and waste water treatment byproducts from the Highwood Generation Station.	Similar to direct and indirect impacts
EMF	None	Existing constructed network of transmission lines.	Potential upgrade of the MATL line to 400 MW in each direction.	None

TABLE 4.1-1 (Continued)
CUMULATIVE IMPACTS FROM PAST, PRESENT, AND FUTURE ACTIONS AND ALL ACTION ALTERNATIVES

Resource	Direct and Indirect Impacts From Action Alternatives	Past and Present Actions that Affect the Resource	Reasonably Foreseeable Future Actions That Could Affect the Resource	Cumulative Impacts
Water	Risk of sediment discharge to surface water during construction at river and stream crossings. Alt 3 poses the lowest risk, and Alt 4 poses the highest risk of contributing sediment to streams.	7 water bodies in the analysis area have impaired or threatened beneficial uses by one or more of the following: weed management, crop fertilization and production, grazing, road use and maintenance, waterway modifications for stock watering.	Operation of the Highwood Generation Station and various planned wind energy projects would likely be implemented if the MATL line was constructed.	Increased risk of introducing sediment and other pollutants to water resources in the analysis area and potentially affect the quantity of available water supplies.
Wetlands	Risk of change in wetland hydrology due to construction disturbance. Impacts would be mitigated or eliminated with implementation of mitigation measures. Alt 3 crosses the least amount of ground and Alt 4 the most that contains wetlands or potential wetlands.	Farming, grazing, weed management. Road use and maintenance, waterway modifications for stock watering.	Operation of the Highwood Generation Station and various planned wind energy projects would likely be implemented if the MATL line was constructed.	Same as direct and indirect impacts.
Vegetation	Temporary loss of vegetation and increased risk of weed emergence and dispersion in disturbed areas until reclaimed. Alt 3 would disturb the least amount and Alt 4 the most of native vegetation.	Grazing, crop cultivation, weed management, Construction of roads, cities and other facilities.	Operation of the Highwood Generation Station and various planned wind energy projects would likely be implemented if the MATL line was constructed.	Same as direct and indirect impacts.

TABLE 4.1-1 (Continued)
CUMULATIVE IMPACTS FROM PAST, PRESENT, AND FUTURE ACTIONS AND ALL ACTION ALTERNATIVES

Resource	Direct and Indirect Impacts From Action Alternatives	Past and Present Actions that Affect the Resource	Reasonably Foreseeable Future Actions That Could Affect the Resource	Cumulative Impacts
Wildlife	Short-term loss of individuals during construction or direct disturbance of species during critical periods in their life-cycles. Long-term habitat alterations, electrocutions, and collisions would result in avian mortality. Impacts would be similar for all alternatives.	Habitat conversion to agriculture; loss of native grassland habitat due to agricultural development; loss of wetland habitat due to drainage for agriculture; and, minor loss in habitat and disturbance related to petroleum pipeline and irrigation development.	Operation of the Highwood Generation Station and various planned wind energy projects would likely be implemented if the MATL line was constructed.	Constructed developments may reduce habitat by a relatively small amount and would not likely consume critical habitats such as large expanses of grasslands or riparian habitats. Operation of wind farms would contribute to long term avian mortality and potentially adversely affect bird migration patterns.
Fish	Risk of habitat degradation through sediment discharge to streams and rivers at alignment crossings during construction. Alt 3 presents the lowest risk to fish habitat, Alt 4 presents the greatest risk.	Weed management, crop fertilization and production, grazing, road use and maintenance, waterway modifications for stock watering.	The operation of the Highwood Generation Station.	Same as direct and indirect effects
Special Status Species	Risk to special status plant species is based on risk to habitat (wetlands). Alt 3 would have the least affect on species of concern. Alts 2 and 4 would have similar risk.	Existing transmission lines. Farming, hunting, cities and towns, residential areas, industrial and commercial areas. Construction of federal and state highways and county roads, railroads, military installations, and airports.	Operation of the Highwood Generation Station and various planned wind energy projects would likely be implemented if the MATL line was constructed.	Same as for Wildlife and Vegetation

TABLE 4.1-1 (Continued)
CUMULATIVE IMPACTS FROM PAST, PRESENT, AND FUTURE ACTIONS AND ALL ACTION ALTERNATIVES

Resource	Direct and Indirect Impacts From Action Alternatives	Past and Present Actions that Affect the Resource	Reasonably Foreseeable Future Actions That Could Affect the Resource	Cumulative Impacts
Air Quality	Alts 3 and 4 would cross the least amount of habitat type used by special status species wildlife.	Refinery, crude oil and natural gas compressor stations, petroleum product terminals, coal-fired electrical generating plants, concrete mix plants, asphalt mix plants, crematoriums, gravel crushers and associated processing equipment, asphalt plants, fugitive dust and smoke sources from farming, field and forest burning, and dust from gravel roads.	Various planned wind energy projects that would likely be implemented if the MATL line was constructed. The operation of the coal-fired Highwood Generation Station by Southern Montana Electric would result in a long-term minor to moderate degradation of local air quality.	Minor short term releases of fugitive gaseous and particulate emissions during the construction phases and operation and maintenance efforts of additional facilities would cumulatively increase risk of affecting air quality in the study area.
Audible Noise	Short-term, localized construction noise. Noise from rain or wind on the transmission line would be below BPA and HUD guidelines	Cities and towns, industrial and commercial areas. Use and maintenance of federal and state highways and county roads, railroads and railroad rights of way, military installations, airports,	Various planned wind energy projects that would likely be implemented if the MATL line was constructed. Noise levels from the operation of the Highwood Generation Station would be audible for several miles from the site.	Noise contributed by wind generation power could affect nearby residences if operated at a wind speed less than 23 miles per hour. Cumulative impact from noise and Alternative 2 is dependent on proximity to residences.

TABLE 4.1-1 (Continued)
CUMULATIVE IMPACTS FROM PAST, PRESENT, AND FUTURE ACTIONS AND ALL ACTION ALTERNATIVES

Resource	Direct and Indirect Impacts From Action Alternatives	Past and Present Actions that Affect the Resource	Reasonably Foreseeable Future Actions That Could Affect the Resource	Cumulative Impacts
Socioeconomics	Increased short-term construction and long-term employment opportunities County and State tax revenues would increase. Opportunities to export electric power & start up new generation sources would increase. Increased competition may reduce cost to ratepayers.	Existing constructed network of pipelines and transmission lines. Ongoing farming, grazing, weed management, hunting, cities and towns, residential areas, industrial and commercial areas.	Potential development of a trading system for firm and non-firm capacity for the MATL line. Various planned wind energy projects that would likely be implemented if the MATL line was constructed. Construction and operation of the coal-fired Highwood Generation Station would have a moderate beneficial effect.	Each new wind generation and a coal-fired generation station would increase jobs by 4 - 26 people during construction and add $98,000 - $400,000 in additional personal income to a region. Operation and maintenance phase may provide 6 - 31 permanent jobs and $103,000 - $1,000,000 in additional annual personal income. Wind projects also provide additional landowner revenue. Tax payments by project owners may reduce the tax burden for other local tax payers
Paleontological & Cultural Resources	Construction activities pose a risk of disturbance of undiscovered cultural & paleontological resource sites and sites not yet adequately inventoried. Alt 2 crosses fewer sites of undetermined eligibility for National Register listing than Alt 4 and more than Alt 3.	Farming, cities and towns, residential areas, industrial and commercial areas. Construction of federal and state highways and county roads, railroads and railroad rights of way, communication facilities, military installations, and airports.	Various planned wind energy projects that would likely be implemented if the MATL line was constructed.	Each wind generation construction site would be required to inventory for cultural resources before disturbance. No cumulative impacts are anticipated.

TABLE 4.1-1 (Continued)
CUMULATIVE IMPACTS FROM PAST, PRESENT, AND FUTURE ACTIONS AND ALL ACTION ALTERNATIVES

Resource	Direct and Indirect Impacts From Action Alternatives	Past and Present Actions that Affect the Resource	Reasonably Foreseeable Future Actions That Could Affect the Resource	Cumulative Impacts
Visuals	Decline in aesthetic quality of a view shed, visual contrast or landscape change due to contrast with natural landscape. Visual impacts are dependent on proximity to viewers. Alt 4 would be visible to fewer residences (within ½ mile) and fewer travel corridor miles. Alt 3 would be most visible.	Existing constructed network of transmission lines. Installation of federal and state highways and county roads, communication facilities, military installations and airports.	Various planned wind energy projects that would likely be implemented if the MATL line was constructed.	Wind generation facilities would be highly visible and not compatible with the natural landscape. Operating windmills would generate a strobe effect and blade glint. Red tower lights at night would also adversely impact visual resources.

Notes:
Alt Alternative
BPA Bonneville Power Administration
EMF Electric and Magnetic Field
GPS Global Positioning System
HUD Housing & Urban Development
MATL Montana-Alberta Tie Line
MW Megawatt

4.3 Irreversible and Irretrievable Commitments of Resources

No irreversible and irretrievable commitments of resources would occur after decommissioning the transmission line at the end of its use. If concrete footings are used, the concrete would be left and irreversibly committed. Fuel used during construction and decommissioning would be irreversibly committed to the project. If wood structures are used, it is probable that these poles would not be available for future transmission projects and would be irreversibly committed to the project. Energy lost during the transmission process (line losses) would be irretrievably committed to the project.

4.4 Short-Term Use and Long-Term Productivity

Short-term uses of the study area are characterized by existing land use of the area as affected by the proposed Project and all activities that such land use facilitates. Long-term productivity involves sustaining the interrelationships of each resource in a condition sufficient to support ecological, social, and economic health.

All action alternatives would manage resources within requisite regulatory standards for air quality, water quality, cultural resource preservation, and wildlife management, and thus would maintain long-term productivity. Impacts from any of the action alternatives to visual resources and farming activities would not adversely affect long-term productivity of the resource. Beneficial impacts to socioeconomic resources would be realized from all action alternatives. Because Alternative 4 contains additional environmental mitigation measures for avoiding adverse impacts to farming, riparian areas, and surface water, this alternative presents the most protective alternative for the maintenance and enhancement of long-term productivity of the environment while benefiting socio-economic resources.

4.5 Regulatory Restrictions Analysis

Alternatives and mitigation measures are designed to further protect environmental, cultural, visual, and social resources, but add to the cost of the Project. Alternatives and mitigation measures that are required by federal or state laws and regulations to meet minimum environmental standards do not need to be evaluated for extra costs to the proponent.

Mitigation measures that might be imposed by DEQ would add up to 3 percent to the cost of the proposed Project (**Table 4.5-1**). Alternative 3 would be less expensive to build than the proposed Project. Alternative 4 would be up to 16 percent more expensive (**Table 4.5-1**). Mitigation measures whose costs can be estimated are precision mapping of unstable soils, archaeologist observation of construction, wetlands

delineation, and bonding for reclamation and revegetation. Monopole structures might also be required in some areas.

TABLE 4.5-1
REGULATORY RESTRICTIONS ANALYSIS

	Alternative 2			Alternative 3	Alternative 4
	with bond mitigation only	with additional mitigation measures	with monopoles and additional mitigation measures	no additional mitigation measures	with additional mitigation measures
Length (miles)	129.9 (all H-frames)	129.9 (all H-frames)	129.9 (25 miles monopoles, 104.9 miles H-frames)	121.6 (all H-frames)	139.9 (87.9 miles monopoles, 52 miles H-frames)
Construction cost[a]	$38,125,650	$38,125,650	$38,950,650	$35,689,600	$43,961,350
Precision mapping of unstable soils[b]	0	$11,000 (11 miles)	$11,000 (11 miles)	$6,000 (6 miles)	$24,000 (24 miles)
Professional archaeologist to observe construction[c]	0	$160,000 (35 sections)	$160,000 (35 sections)	$160,000 (37 sections)	$160,000 (35 sections)
Delineate wetlands on alignment through Teton County[d]	0	$11,500 (23 miles)	$11,500 (23 miles)	$13,000 (26 miles)	$13,000 (26 miles)
Estimated bond	$500,000	$500,000	$500,000	$420,000	$615,000
Total cost	$38,625,650	$38,808,150	$39,633,150	$36,288,600	$44,773,350
Percent change	0	+0.4	+3	-6	+16

[a] H-frame structures $293,500 per mile; long-span monopole structures $326,500 per mile (MATL 1/26/07).

[b] $1,000 per mile of alignment, 500 feet wide.

[c] $1,000 per day each for two full-time archeologists for 4 months.

[d] $1,000 per day per wetland specialist at 2 linear miles of alignment per day.

The costs of other measures, such as damage payments and requiring the use of conductors with dulled, non-reflective surfaces, are not readily quantifiable but would add to the total cost of the Project.

MATL has already negotiated easements across portions of the proposed Project alignment. The cost to MATL is unknown. If MATL has already paid for right-of-way access to lands that may be crossed by the Alternative 2 alignment, and that alignment is not permitted, MATL may lose the money already spent.

Alternative 2 with additional mitigation measures and the use of long-span monopoles on selected portions of the transmission line would impose the least regulation on MATL's private property rights while reducing environmental impacts.

5.0 Consultation and Coordination

MFSA requires that a project applicant consult with government agencies to identify their concerns over the facility's possible locations or effects on the environment, to discuss mitigation measures suggested by the agencies, and to explain how the agency concerns were incorporated into identifying the proposed project and alternative locations. MEPA and NEPA require DEQ and DOE to consult with local, federal, and state agencies about the proposed Project during the project scoping.

DEQ and DOE have consulted with the applicant, other federal and state agencies, local governments, and with individuals and non-government stakeholders. The consultation process took place during scoping and follow-up discussions. Interested individuals and organizations, affected federal, state, and local agencies, as well as affected Indian Tribes were invited to submit comments to DEQ and DOE. MFSA requires FWP, DNRC, MDT, the Department of Revenue, and the Public Service Commission to report their recommendations on this project to DEQ. Results of this reporting will be incorporated into the final EIS.

Initial Consultation and Coordination

The MFSA consultation process began on May 9, 2005, when MATL representatives met with DEQ personnel to introduce the proposed project and discuss issues or concerns during initial stages of the MFSA application process. MATL conducted open house sessions in Conrad and Cut Bank, Montana, on June 29 and 30, 2005, to provide the public an opportunity to meet representatives of the MATL project team and obtain information on the scope of the project. These open houses provided a venue for the public to voice and document their concerns and issues to MATL.

DEQ hosted an interagency project meeting on August 26, 2005, in Helena, Montana, to familiarize participating agency personnel with the proposed Project, to field agency questions, and to formalize agency roles and responsibilities. Attendees for the August 26, 2005 meeting included personnel from the following agencies:

- DEQ
- U.S. Department of Energy (DOE; via teleconference)
- Montana Fish, Wildlife and Parks (FWP)
- Montana Department of Transportation (MDT)
- Montana State Department of Commerce
- DNRC

MATL submitted a MFSA application to DEQ on December 1, 2005, and submitted additional information and/or amended the application on January 11, January 24, March 16, March 30, June 9, July 31, August 11, November 30, and December 15, 2006.

Public Scoping

Three public scoping meetings were held in Cut Bank, Conrad, and Great Falls in early December 2005. The scoping process is discussed in sections 1.5 and 1.6. A follow-up meeting was held in Cut Bank on June 26, 2006. The December 2005 and June 2006 public meetings were advertised in *The Valierian*, *The Cut Bank Pioneer Press*, *The Glacier Reporter*, and *The Shelby Promoter* for a 3-week period prior to meetings. Based on the additional public comments and to address deficiencies in the original December 1, 2005, application, MATL revised its MFSA application and provided additional information as discussed above.

DOE also published a Notice of Intent to Prepare an Environmental Assessment and to Conduct Public Scoping Meetings in the *Federal Register* on November 18, 2005 (70 FR 69962). A copy of this notice was transmitted by mail to land owners in the study area.

Formal and Informal Consultation and Coordination

In addition to the general meetings and telephone contacts, DEQ hosted a meeting in Great Falls on October 6, 2006, to share information about multiple projects that may involve construction in and around the NWE Great Falls 230-kV switch yard. Meeting attendees for the October 6, 2006, Great Falls meeting included personnel from the following agencies and organizations:

- DEQ
- MATL
- NorthWestern Energy Corporation
- Western Area Power Administration (WAPA)
- PPL Montana
- Montana Fish, Wildlife and Parks (FWP)
- Sheffels Farms, Inc.
- Joe Stanek Farms (area landowner)
- Tetra Tech

Concerned citizens have submitted written comments and suggestions and have called DEQ throughout the process.

DEQ, DOE, and MATL have sought consultation from other interested individuals, SHPO, and non-government organizations, as well as affected Indian Tribes. Formal consultation with SHPO is ongoing. **Table 5.0-1** provides a listing of the non-government stakeholders that were contacted by MATL or DEQ about the proposed MATL project.

MATL also sought consultation with the Blackfeet Tribal Council in Browning. On September 12, 2005, MATL and representatives from their project team met with Blackfeet Tribal Council members in Browning to discuss potential effects on tribal economic, social, and traditional lands interests. Blackfeet Tribal Council members, staff, and interested parties in attendance included: Owna Scott-Big Bull, William Big Bull, John Murray, Teri Lawrence, Wendy Running Crane, Brian Crawford, Terry Tatsey, Douglas Quade, Curly Bear Wagner, Joseph Weatherwax, Kenneth Augare, Gerald Wagner, Pat Schildt, and Earl Old Person. Following introductions and a brief project overview provided by MATL personnel, Blackfeet Councilmen, staff, and tribal members raised several substantive issues that were addressed or recorded for follow-up.

TABLE 5.0-1
MATL PROPOSED PROJECT
NON-GOVERNMENTAL ORGANIZATIONS CONTACTED

Organization	Contact Person	Contact Information
Ducks Unlimited	Layne Krumwiede Regional Director	1023 West St. Lewistown, MT 59457 (406) 538-9094
Northern Plains Resource Council	Teresa Erickson Staff Director	2401 Montana Ave. Suite 200 Billings, MT 59101 (406) 248-1154
Montana Environmental Information Center	Patrick Judge Energy Program Director	P.O. Box 1184 Helena, MT 59624 (406) 443-2520
Montana Stockgrowers Association	Steve Pilcher Director	420 No. California Ave. Helena, MT 59601 (406) 442-3420
Montana Stockgrowers Association	Keith Schott President	750 6th St. S.W. P.O. Box 1165 Great Falls, MT 50403 (406) 761-4596
The Nature Conservancy	Susan Benedict Program Associate	32 South Ewing Helena, MT 59601 (406) 443-0303
Montana Land Reliance	William Long Managing Director	324 Fuller Ave. P.O. Box 355 Helena, MT 59624-0355 (406) 443-7027
National Audubon Society, Montana Chapter	Janet Ellis Acting Exec. Director	P.O. Box 595 Helena, MT 59624 (406) 443-3949
Alternative Energy Resources Organization	--	432 N. Last Chance Gulch Helena, MT 59601 (406) 443-7272
Natural Heritage Program	Sue Crispin Director	1515 East 6th Avenue P.O. Box 201800 Helena, MT 59620
Sheffels Farms	Jim or John Sheffels Owners/operators	Box 1545 Great Falls, MT 59403
Stanek Property	Joe Stanek or Lyle Meeks	Lyle Meeks, P.E. NCI Engineering Inc. P.O. Box 6350 Great Falls, MT 59401
Diamond Valley Area Landowners	Katrina Martin	Ms. Katrina Martin Dutton, MT 59433 (406) 463-2337

6.0 List of Preparers

Department of Environmental Quality

Tom Ring	Project Coordinator	B.S., Fish and Wildlife Management B.S., Earth Science
Greg Hallsten	Project Coordinator	B.S., MS Range Management B.S., Wildlife Biology
Warren McCullough	EIS Reviewer	B.A., Anthropology M.S. Geology
Nancy Johnson	Visuals EIS Reviewer	B.S., Education M.S., Secondary Education M.L.A, Landscape Architecture
Jeff Blend	Socioeconomics Transmission System Analysis	B.S., Economics M.S., Economics PhD., Agricultural Economics

Tetra Tech

Cameo Flood	Assistant Project Manager Land Use, Farming and Ranching	B.S., Forestry
J. Edward Surbrugg	EIS Project Manager Vegetation/Wetlands	B.S., Range Ecology M.S., Land Rehabilitation Ph.D., Soil Science
Jim Dushin	Visual Simulations	A.AS., Forestry B.S., Wildlife Biology
Chris Reynolds	Geology and Soils	B. S., Geology M.S. Geochemistry/Hydrogeology
Ed Madej Stacy Pease	Database/GIS Wildlife/Fisheries	B.S., Biology and Oceanography M.S. Watershed Management B.S. Wildlife and Fisheries Science
Gary Sturm, P.E.	Engineering	B.S., Engineering Physics M.S., Civil Engineering
Alicia Stickney	Editorial Review, Community Resources	B.A., English M.S., Geology
Alice Stanley	MEPA/NEPA Specialist Hydrology	B.S., Geology M.S., Geology
Alane Dallas	Word Processing/ Admin Record	
Linda Daehn	Public Relations	B.S., Journalism
Dan Buffalo	Groundwater	M.S., Water Resources Management B.S., Biology
Chris Martin	Surface Water/Visuals	M.S. Coursework, Mathematics Teacher Cert/B.A. Equiv., Mathematics B.S., Watershed Science – Hydrology
Earl Griffith	Utilities and Transportation	B.S., Earth Science (Geology) M.S., Earth Science (Geology)

H. Mark Blauer	Human Health and Environment	PhD., Nuclear Chemistry M.S., Earth and Space Sciences B.S., Chemistry
Heidi Raymer	Electromagnetic Effects	B.S., Nursing B.S., Environmental Occupational Safety and Health
Jay Rose	Presidential Permit	B.S., Ocean Engineering J.D.
Amy Sivers	Hazardous Materials	M.S., Geosciences B.A., Geography
C. Ray Windmueller	Air	B.S., Petroleum Engineering
Nancy Linscott	Socioeconomics and Environmental Justice	B.S., Earth Science (Geology) M.S., Environmental Policy and Management
Keith Cron	Noise	M.S., Industrial Hygiene B.S., Science and Engineering

HRA

Weber Greiser	Cultural Resources	B.S., Anthropology M.A., Anthropology

Glossary

Affected Environment: Existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as the result of a proposed human action.

Air Pollution: Dust, fumes, smoke, other particulate matter, vapor, gas, odorous substances or any combination of these.

Alignment: The facility location.

Alluvial: Composed of alluvium or deposited by a stream or running water.

Alluvium: A general term for all deposits resulting from the operations of modern rivers and creeks, including the sediments laid down in riverbeds, floodplains, and fans at the foot of mountain slopes.

Ambient Air Quality Standard: An established concentration, exposure time, and frequency of occurrence of air contaminant(s) in the ambient air that shall not be exceeded.

Ambient Level: The existing level of air pollutants, noise, or other environmental factors used to describe background conditions (i.e., conditions before a project is implemented).

Analysis area: The area, defined for each resource, which the impact analysis addresses. The analysis boundary is different for each resource. For instance, the impact to soils or vegetation of a transmission pole may be confined to the structure footprint. The impact to land use may be the entire field in which the structure is placed.

Aquifer: Rock or sediment which is saturated with water and sufficiently permeable to transmit economic quantities of water to wells.

Benthic: of, relating to, or occurring at the bottom of a body of water.

Best Management Practices: A practice or combination of practices that are determined to be the most effective and practicable (including technological, economic, and institutional considerations) means of controlling point and nonpoint pollutants at levels compatible with environmental quality goals.

Big Game: Those species of large mammals normally managed as a sport hunting resource.

Centerline: See reference centerline.

Colluvium: Rock detritus and soil accumulated at the foot of a slope.

Community Noise Equivalent (CNEL): The energy average noise level in dB(A) over a 24-hour period with a 5 decibel penalty assigned to evening noise (7 p.m. to 10 p.m.) and a 10 decibel penalty assigned to nighttime noise (10 p.m. to 7 a.m.).

Conductor: Wires or lines that carry the electrical current in a transmission line.

Cooperative Electric Utility: A utility established to be owned by and operated for the benefit of those using its services.

Corona: Breakdown of the air, for example, on the surface of a high-voltage conductor, to produce air ions

CRP Lands: Farmlands for which a landowner receives an annual payment and cost-share assistance to establish long-term resource conserving covers. Administered by the U.S. Farm Service Agency.

Cultural Resources: Those fragile and nonrenewable remains of human activities, occupations, and endeavors as reflected in sites, buildings, structures, or objects, including works of art, architecture, and engineering.

Cumulative effect: Environmental effects that result from the incremental impact of a Proposed Action in addition to other actions (past, present, or future) in the vicinity. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Current: The flow of electricity. A voltage will always try to drive a current. The size current that is driven depends on the resistance of the circuit.

dB(A): Stands for A weighted decibels. This decibel scale is used to approximate the way human hearing responds more to some frequencies than to others.

Dead end: A point on a distribution line where conductors terminate. A "double dead-end" has conductors terminating from two directions. Jumper wires are used to connect these two sets of conductors.

Dead end: (angle greater than 45°): A transmission line structure that would be used where the line turns at an angle greater than 45°. The structure used in this instance would be a 3 pole dead end.

Dead end: (angle less than 1°): A transmission line structure that would be used where the line turns less than 1°. The structure used in this instance would be a 4 pole dead end.

Direct impact: An effect that results solely from the construction or operation of the Proposed Action.

Easement: a general term for a limited right to make use of a property owned by another party.

Electric fields: Produced by voltages, irrespective of how much current is flowing and indeed whether any current is flowing at all. The electric field is the region around a conductor where a force will be experienced by a charge.

Electric Grid: All parts of an electrical system that are directly connected to each other through alternating current transmission lines. The term used in the industry is "Interconnection."

Electric Transmission Grid: The western grid moves power from many different generating plants to customers and their electric loads.

Electromagnetic interference: high frequency electrical noise that can cause radio and television interference.

Emergent Wetland: Any area of a vegetated wetland where non-woody vegetation (e.g. cattail, grasses, sedges) comprises at least 30 percent areal cover.

Eminent Domain: need description

Emission: The release of air contaminants into the ambient air.

Emission Standard: A requirement established under the federal Clean Air Act which limits the quantity, rate, or concentration of emissions of air contaminants on a continuous basis.

EMFs: Electric and magnetic fields. Sometimes also defined as electromagnetic fields, which usually means the same thing

Environmental effect: Any change that an action may cause in the environment, including biological resources, land use, health and socioeconomic conditions, cultural heritage, geology, and paleontology.

Environmental Justice: Evaluation of potential disproportionately high and adverse impacts on low income and/or minority populations that may result from a Proposed Action.

Ephemeral Drainage: A stream or stream segment that flows only briefly in response to local precipitation and has no base flow.

Erosion: Wearing away of soil and rock by weathering and the actions of surface water, wind, and underground water.

Farmland of Statewide Importance: Land that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. Criteria for defining and delineating this land are to be determined by the appropriate State agency or agencies. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods.

Federal Energy Regulatory Commission (FERC): The federal commission that regulates interstate and wholesale power transactions, including power sales and transmission services, as well as licensing of hydroelectric projects.

Fugitive Dust: A particulate emission made airborne by forces of wind, human activity, or both. Unpaved roads, construction sites, and tilled land are examples of areas that originate fugitive dust.

Heavy angle structure: A transmission line structure that would be used where the line turns between 30° and 45°.

Impact zone: The study area in which data are collected during the baseline study in order to make a determination of the impacts from construction, operation, maintenance, or decommissioning of a proposed facility or associated facility at preferred and reasonable alternative locations.

Indirect impact: An effect that is related to but removed from a Proposed Action by an intermediate step or process.

Insulators: a device made of porcelain or polymer that prevents energized conductors from coming in contact with each other. They also prevent conductors from energizing structures or facilities that are not designed to carry electricity. Bushings are a type of insulator.

Intermittent Stream: A stream that flows in a well-defined channel in response to precipitation and is dry for part of the year.

Kilovolt (kV): 1,000 Volts. The Volt is unit for measuring electrical potential, or "pressure."

Kilovolt ampere (kVA): The practical unit of apparent power, which is 1,000 volt-amperes. The volt-amperes of an electric circuit are the mathematical products of the volts and amperes of the client.

Kilowatt (kW): The electric unit of power equal to 1,000 watts.

Kilowatt-Hour (kWh): The basic unit of electric energy equal to one kilowatt of power supplied to or taken from an electric circuit for one hour.

Lacustrine: Of, relating to, formed in, living in, or growing in lakes.

Lek: A traditional courtship display area attended by male sharp-tailed grouse or sharp-tailed grouse.

Linear facility: An electric transmission line or pipeline covered under Montana's Major Facility Siting Act.

Load: The amount of electric power delivered or required at any specified point or points on a system. Load originates primarily at the power consuming equipment of the customer.

Megawatt (MW): One million watts.

Megawatt-hour (MWh): One thousand kilowatt-hours or one million-watt hours.

Medium angle structure: A transmission line structure that would be used where the line turns between 5° and 30°.

Mesic: Characterized by, relating to, or requiring a moderate amount of moisture.

Milligauss: A unit of measurement for magnetic fields.

Mitigation: An action to avoid, minimize, reduce, eliminate, replace or rectify the impact of a management practice.

Montana Major Facility Siting Act (MFSA): This law governs the siting of most large energy transporting facilities in Montana.

National Environmental Policy Act of 1969 (NEPA): This act requires federal agencies to evaluate the environmental effects of Proposed Actions.

Nitrogen Dioxide (NO_2): A reddish brown gas that is a component of smog.

Nitrogen Oxides (NO_x): A group of compounds containing varying proportions of nitrogen and oxygen.

No Action Alternative: The No Action alternative is required by MEPA regulations implementing NEPA. The No Action alternative provides a baseline for estimating the effects of other alternatives. Where a project activity is being evaluated, the No Action alternative is defined as one where No Action or activity would take place.

Nonattainment: Description of areas of the state not yet in compliance with National Ambient Air Quality Standards.

North American Electric Reliability Council (NERC): Council formed by electric utility industry in 1968 to promote the reliability and adequacy of bulk power supply in utility system of North America. NERC consists of ten regional reliability councils: Alaskan System Coordination Council (ASCC); East Central Area Reliability Coordination Agreement (ECAR); Electric Reliability Council of Texas (ERCOT); Mid-America Interconnected Network (MAIN); Mid-Atlantic Area Council (MAAC); Mid-Continent Area Power Pool (MAPP); Northeast Power Coordinating Council (NPCC); Southeastern Electric Reliability Council (SERC); Southwest Power Pool (SPP); Western Systems Coordinating Council (WSCC). **[is this more than we need to know?]**

Noxious Weed: Exotic (non-native) species of plants that proliferate and reduce the value of land for agriculture, forestry, livestock, wildlife, or other beneficial uses.

Operational right of way: MATL defined the transmission line operational right of way as 45 feet wide (22.47 feet to either side of the centerline).

Palustrine: Inland wetland that lacks flowing water and contains less than 0.05 percent ocean-derived salts.

Per capita personal income: According to the U.S. Bureau of Economic Analysis, the average income received per person. This includes income received from all sources such as wages, proprietor's income, rental income, and dividend income.

Personal income (Total): Income received from all sources.

Prime Farmland: Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, rangeland,

forest land, or other land, but not urban built-up land or water). It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods.

Reference centerline: The facility location. DEQ approves a 500-foot-wide facility location (250 feet to either side of a presumed centerline unless there is a compelling reason to enlarge or narrow this width.

Right of way: The right to pass over property owned by another. The strip of land over which facilities such as roadways, railroads, pipeline, or power lines are built.

Salmonid: Any of a family (Salmonidae) of elongate bony fishes (as a salmon or trout) that have the last three vertebrae upturned.

Special Status Species: Those species of plants or animals that have a protective status designated by a state or federal agency because of general or localized population decline.

Substation: an installation which accomplishes one or more of the following:

- voltage changed from one level to another level.
- voltage regulated to compensate for system voltage changes.
- electric transmission and distribution circuits switched into and out of the system.
- electric power flowing in the transmission and distribution circuits measured.
- communication signals are connected to the circuits.

System reliability: the ability of a power system to provide uninterrupted service.

Tertiary: The Tertiary period or system of rocks.

Topsoil: Fertile soil or soil material, usually rich in organic matter, used to top dress disturbed areas. Topsoil is better suited to supporting plants than other materials.

Total Maximum Daily Load (TMDL): The total amount of a pollutant, per day, (including a margin of safety) that a waterbody may receive from any source (point, nonpoint, or natural background) without exceeding the state water quality standards. The term frequently refers to a plan or strategy to return a

waterbody to compliance with the water quality standards and therefore fully supporting of its designated uses.

Transmission capacity: the maximum load that a transmission line or network of transmission lines is designed to carry.

Transmission lines: High voltage electric conductors used for bulk movement of large volumes of power across relatively long distances.

Transmission restricted: the existing transmission capability is limiting the flow of electricity into and out of the area, in this case, Montana.

Utility: A regulated entity which exhibits the characteristics of a natural monopoly. For the purposes of electric industry restructuring "utility" refers to the regulated, vertically integrated electric company. "Transmission utility" refers to the regulated owner/operator of the transmission system only. "Distribution utility" refers to the regulated owner/operator of the distribution system which serves retail customers.

Viewshed: The landscape that can be directly seen under favorable atmospheric conditions, from a viewpoint or along a transportation corridor.

Volatile Organic Compound (VOC): Any of several compounds of carbon that participate in atmospheric photochemical reactions, forming secondary pollutants.

Volt: A unit of electrical pressure. It measures the force or push of electricity. Volts represent pressure, correspondent to the pressure of water in a pipe. A volt is the unit of electromotive force or electric pressure analogous to water pressure in pounds per square inch. It is the electromotive force which, if steadily applied to a circuit having a resistance of one ohm, will produce a current one ampere.

Volt-amperes: The volt-amperes of an electric circuit are the mathematical products of the volts and amperes of the client.

Voltage: Measure of the force of moving energy.

Watt: The electric unit of power or rate of doing work. One horsepower is equivalent to approximately 746 watts.

Watt-Hour: One watt of power expended for one hour.

Western Systems Coordinating Council (WSCC): One of the ten regional reliability councils that make up the North American Electric Reliability Council (NERC).

Wetlands: Areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances, does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wide Area Augmentation System (WAAS): Augments GPS with additional signals for increasing the reliability, integrity, accuracy and availability of GPS.

Xeric: Characterized by, relating to, or requiring only a small amount of moisture.

Acronym List

ACSR	Aluminum Core Steel Reinforced
AESO	Alberta Electric System Operator
aMW	average megawatts
APLIC	Avian Power Line Interaction Committee
ARM	Administrative Rules of Montana
BLM	U.S. Bureau of Land Management
BPA	Bonneville Power Administration
CAMA	Computer Assisted Mass Appraisal
cfs	Cubic feet per second
CFR	Code of Federal Regulations
COE	U.S. Army Corps of Engineers
CO	Carbon monoxide
CRP	Conservation Reserve Program
dBA	A-weighted decibels
DEQ	Montana Department of Environmental Quality
DNRC	Department of Natural Resources & Conservation
DOE	U.S. Department of Energy
EEI	Edison Electric Institute
EIS	Environmental impact statement
EPA	U.S. Environmental Protection Agency
EMF	Electric and magnetic field
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Plan
FERC	Federal Energy Regulatory Commission
ft	feet
ft²	square feet
ft/day	feet per day
FWP	Montana Department of Fish, Wildlife and Parks
FWS	U.S. Fish and Wildlife Service
GIS	Geographical Information System
GPS	Global Positioning System
HUC	Hydrologic unit codes
HUD	Housing and Urban Development

Kcmil	1,000 circular mils
kV	Kilovolt
kV/m	Kilovolts per meter
kWh	Kilowatt hour
L_{dn}	day-night average noise level
LIDAR	Light Detection and Ranging
mA	Milliampere
MATL	Montana-Alberta Tie, Ltd.
MBMG	Montana Bureau of Mining and Geology
MCA	Montana Code Annotated
MDT	Montana Department of Transportation
MEPA	Montana Environmental Policy Act
MFSA	Major Facility Siting Act
mG	Milligauss
MHz	megahertz
MPDES	Montana Pollution Discharge Elimination System
MRMC	Missouri River Medical Center
mVA	Megavolt-amperes
MW	Megawatt
ND	No data
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Council
NESC	National Electric and Safety Code
NHP	Montana Natural Heritage Program
NIEHS	National Institute of Environmental Health Sciences
NOAA	National Oceanic and Atmospheric Administration
NO_x	Nitrogen oxide
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRIS	Natural Resource Information System
NWE	NorthWestern Energy
NWR	National Wildlife Refuge
NWS	National Weather Service
OASIS	Open Access Same Time Information System
OSHA	Occupational Safety and Health Act
PAB	Palustrine Aquatic Bed wetlands
Pb	Lead
PEM	Palustrine emergent

PM_{10}	Particulate matter smaller than 10 microns
$PM_{2.5}$	Particulate matter smaller than 2.5 microns
PPL	Pacific Power and Light
ppm	Parts per million
PSD	Prevention of Significant Deterioration
PUB	Palustrine Unconsolidated Bottom wetlands
PUS	Palustrine Unconsolidated Shore wetlands
SHPO	State Historic Preservation Office
SO_2	Sulfur dioxide
SSSA	Soil Science Society of America
SWPPP	Storm Water Pollution Prevention Plan
TBD	To be determined
TMDL	Total maximum daily load
USC	United States Code
WAAS	Wide Area Augmentation System
WAPA	Western Area Power Administration
WECC	Western Electricity Coordinating Council
WPA	Waterfowl Production Area
WRCC	Western Regional Climate Center
$\mu g/m^3$	Micrograms per square meter
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey

8.0 Responses to Public Comments

9.0 References

A

ABB Consulting 2005. System Feasibility Study Summary, conducted for Montana Alberta Tie Ltd. April 13.

AirNav.com. 2006. Federal Aviation Administration information on Conrad and Horner Field Airports. Accessed October 2006. Online address: http://ww.airnav.com

Alberta Department of Energy. 2006. Accessed on October 10 and 12, 2006. Online address: http://www.energy.gov.ab.ca

Alberta Electric System Operator (AESO). 2007. "information webpage." Accessed in January. http://www.aeso.ca/index.html

Alberta Government Services, Utilities Consumer Advocate. 2006. "How Electricity Gets To You." Accessed on October 12, 2006. Online address: http://www.ucahelps.gov.ab.ca/84.html

Avian Power Line Interaction Committee (APLIC) and U.S. Fish and Wildlife Service (FWS). 2005. "Avian Protection Plan Guidelines." April.

B

Bat Conservation International. 2002. "Bat Species of the United States." Accessed in September 2005. Online address: http://www.batcon.org

Beaulaurier, D.L. 1981. "Mitigation of Bird Collisions with Transmission Lines." Bonneville Power Administration. Portland, Oregon.

Beaulaurier, D.L., B.W. James, P.A. Jackson, J.R. Meyer, J.M. Lee Jr. 1982. "Mitigating the Incidence of Bird Collisions with Transmission Lines." Pages 539-550. In: Third Annual International Symposium on Environmental Concerns in Rights-Of-Way Management, San Diego, California.

Blend, Jeff. 2007a. Personal communication Jeff Blend, Montana DEQ Economist with Alice Stanley, Tetra Tech Resource Specialist. January 17.

Blend, Jeff. 2007b. Social and Economic Affects of MATL on Montana's Transmission System, Ratepayers, and Electrical Generation Developers, Internal Specialist Report, Montana Department of Environmental Quality.

Brady, N.C. 1990. *The Nature and Properties of Soils*. MacMillan Publishing Company, New York.

Bonneville Power Administration (BPA). 1982. Schultz-Hanford Area Transmission Project Appendix I: Electrical Effects.

Broesder, Bruce. 2006. Personal communication Bruce Broesder, Service Warranty Writer for Torgerson's Inc., Great Falls, MT with Earl F. Griffith, P.G., Tetra Tech Senior Scientist. July 6.

Bureau of Indian Affairs. 2005. Calculation of Unemployment Rates for Montana Indian Reservations. Department of the Interior.

C

Computer Assisted Mass Appraisal (CAMA). 2006. Accessed on September 21, 2006. Online address: http://gis.mt.gov/

Chouteau Acantha. 2004. "Wheat, Barley Top Grain Crops Along Front Range." Author unknown. http://www.Chouteauacantha.com/articles/2004/

Connelly, J. W., M. A. Schroeder, A. R. Sands, and C. E. Braun. 2000. "Guidelines for Management of Sage Grouse Populations and Habitats." *Wildlife Society Bulletin*. Volume 28. Pages 967 through 985.

Conway, C.J. and J.C. Simon. 2003. "Comparison of Detection Probability Associated with Burrowing Owl Survey Methods." *Journal of Wildlife Management*. Volume 67. Number 3. Pages 501 through 511.

Cowan, James. 1994. *Handbook of Environmental Acoustics*. John Wiley and Sons.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979 (Reprinted 1992). "Classification of Wetlands and Deepwater Habitats of the United States." U.S. Department of the Interior, Fish and Wildlife Service. FWS/OBS-79/31.

D

Dodds, Dan. 2006. Personal communication Dan Dodds, Tax Policy Analyst, Montana Department of Revenue with Nancy Linscott, Tetra Tech, Socioeconomist. July 13 and July 28.

DuBois, K. 1989. "Arising, alighting ibis." *Montana Outdoors*. Volume 20. Number 6. Pages 30 through 33.

E

Edison Electric Institute (EEI) and Avian Power Line Interaction Committee (APLIC). 1996. *Suggested Practices for Raptor Protection on Power Lines*. Edison Electric Institute/Raptor Research Foundation, Washington, D.C. 128 Pages.

Electric Power Research Institute. 1982. *Transmission Line Reference Book*, 345-kV and Above, Second Edition.

Elert, Glen. 2006. *The Physics Factbook*. Accessed on June 12, 2006. Online address: http://hypertextbook.com/facts/2000/AliceHong.shtml

Energy Central News. 2007. "General Cable Announces Major Underground High-Voltage Award." Accessed on January 24, 2007. Online address: http://www.energycentral.com/centers/news

Energy Power Research Institute. 2003. "Transmission Lines and Property Values: State of the Science (abstract)." Online address: http://my.epri.com

Enge, P. and R. Hatch. 1998. "Benefits of Second and Third Civil Frequencies," Proceedings of the 1998 National Technical Meeting. The Institute of Navigation. Pp 31-40. January 21 through 23.

Evans, Krista L. 2001. "Eminent Domain in Montana." Legislative Environmental Policy Office. Environmental Quality Council. Helena, Montana. Page 44. Accessed on September 19, 2006. Online address: http://www.leg.mt.gov/content/publications/lepo/2001edhandbook.pdf

F

Faanes, C.A. 1987. "Bird Behavior and Mortality in Relation to Power Lines in Prairie Habitats." U.S. Fish and Wildlife Service. Fish and Wildlife Technical Report 7.

Frison, George C. 1991. *Prehistoric Hunters of the High Plains* (2nd ed.). Academic Press: San Diego, CA.

Frison, George C. 2001. "Hunting and Gathering Tradition: Northwestern and Central Plains." In *Plains*, edited by Raymond J. DeMallie, Pages 131 through 145. *Handbook of North American Indians*. Volume 13. W.C. Sturtevant, general editor. Smithsonian Institution, Washington D.C.

Furukawa Review. 2002. "Development of Conductors with Reduced Wind Drag and Wind Noise for Overhead Power Transmission Lines." Volume No. 21.

G

Genter, D.L. and K.A. Jurist. 1995. "Bats of Montana." Montana Natural Heritage Program, Helena, Montana. Online address: http://nris.state.mt.us/mtnhp

Georgia Transmission Corporation. 2006. "Underground Lines—Why Not Build Transmission Lines Underground?" Accessed on November 9, 2006. Online address: http://www.gatrans.com

Great Falls Development Authority. 2005. "Great Falls informational web site." Online address: http://www.gfdevelopment.org.

Greiser, Sally T. 1984. "Projectile Point Chronologies in Southwestern Montana." *Archaeology in Montana*. Volume 25. Number 1. Pages 35 through 52.

Greiser, Sally T. 1994. "Late Prehistoric Cultures on the Montana Plains." In *Plains Indians, AD 500-1500: The Archaeological Past of Historic Groups*. Karl B. Schlesier, editor. University of Oklahoma Press, Norman. Pages 34 through 55.

H

Hanna, Rebecca. 2003. "Paleontological Overview for the Western United States." Report prepared for Historical Research Associates, Inc. Missoula, MT.

Hansen, P.L., R.D. Pfister, K Boggs, B.J. Cook, J. Joy, and D.K Hinckley. 1995. "Classification and Management of Montana's Riparian and Wetland Sites." Montana Forest and Conservation Experiment Station and The University of Montana, School of Forestry. Miscellaneous Publication No. 54. May.

Hendricks, P. 2000. "Preliminary Bat Inventory of Caves and Abandoned Mines on BLM Lands, Judith Mountains, Montana." Montana Natural Heritage Program, Helena, Montana. 21 Pages.

I

Independent Power Producers Society of Alberta. 2006. "About Deregulation." Accessed on October 12, 2006. Online address: http://www.ippsa.com/dereg.html

International Commission on Non-Ionizing Radiation Protection. 2003. "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (Up to 300 GHz)." Accessed March 21, 2003. Online address: http://www.icnirp.de/downloads.htm.

J

James, B.W. and B.A. Haak. 1979. "Factors Affecting Avian Flight Behavior and Collision Mortality at Transmission Lines." Final Report. Bonneville Power Administration, Portland, Oregon.

Johnson, Bob. 2005. Personal communication Bob Johnson, Refuge Supervisor, U.S. Fish and Wildlife Service Benton Lake National Wildlife Refuge with Meghan Trainer Fitch, AMEC Biologist. September.

Jones, W.M. 2003. "Milk and Lower Marias River Watersheds: Assessing and Maintaining the Health of Wetland Communities." Report to the Bureau of Reclamation. Montana Natural Heritage Program. Helena, Montana.

K

Kingery, Paul. 1991. Corona and Field Effects Program on the MicroSoft FORTRAN Version 5.10 Compiler. Based on previous versions compiled by the Bonneville Power Administration. June.

Kuchler, A.W. 1964. Potential Natural Vegetation of the Conterminous United States (map and manual): American Geographic Society Special Publication 36, scale 1:3,168,000.

L

Levings, J.F. 1982. Potentiometric-surface Map of Water in the Eagle Sandstone and Equivalent Units in the Northern Great Plains Area of Montana: U.S. Geological Survey Open-File Report 82-565.

M

Malone, Michael and Richard Roeder. 1976. *Montana: A History of Two Centuries*. University of Washington Press, Seattle, Washington.

McDonald, Jim. 2006. Personal communication Jim McDonald, Teton County road foreman, Chouteau, MT, with Earl F. Griffith, P.G., Tetra Tech Senior Scientist. July 6.

Meyer, J.R. 1978. "Effects of Transmission Lines on Bird Flight Behavior and Collision Mortality." Prepared for Bonneville Power Administration Engineering and Construction Division, Portland, Oregon.

Montana –Alberta Tie Limited (MATL). 2006a. News release: *MATL Sells Out Capacity*. July 6, 2006. Received via e-mail from Tom Ring, DEQ, to J. Edward Surbrugg, Tetra Tech EMI, Helena, Montana.

MATL. 2006b. Montana Major Facility Siting Act (MFSA) Application Revised August 2006. Montana Alberta Tie Ltd. Project 230-kV AC Power Transmission Line. Lethbridge, Alberta – Great Falls, Montana. August 11. The revised application includes the following original documents and updates:

- Montana Major Facility Siting Act (MFSA) Application. Montana Alberta Tie Ltd. Project 230-kV AC Power Transmission Line. Lethbridge, Alberta – Great Falls, Montana. December 1, 2005.
- Response to Supplemental Information Requests. Montana Alberta Tie Ltd. Project , 230-kV AC Power Transmission Line – Lethbridge, Alberta – Great Falls, Montana. March 16, 2006.
- Response to Supplemental Information Requests. Montana Alberta Tie Ltd. Project , 230-kV AC Power Transmission Line – Lethbridge, Alberta – Great Falls, Montana. March 30, 2006.
- Appendix I Updated Tables for Sections 4.3.4, 4.7. April 18, 2006.
- Letter to Warren McCullough, Chief, Environmental Management Bureau, Permitting and Compliance Division, DEQ, regarding MATL 230-kV Transmission Line Information Request. January 26, 2007.
- MATL Response to Tetra Tech's January 15th, 2007 Information/Clarification Requests. Received from AMEC by e-mail February 1, 2007.

Montana Bureau of Mines and Geology (MBMG). 2002a. Geologic map of the Conrad 30' x 60' Quadrangle North-Central Montana. Open File Report MBMG 444.

MBMG. 2002b. Geologic map of the Cut Bank 30′ x 60′ Quadrangle Northwestern Montana. Open File Report MBMG 454.

MBMG. 2002c. Geologic map of the Great Falls North 30′ x 60′ Quadrangle Central Montana. Open File Report MBMG 459.

MBMG. 2002d. Geologic map of the Valier 30′ x 60′ Quadrangle Northwestern Montana. Open File Report MBMG 453.

Montana Department of Commerce. 2005. State of Montana Population Estimates. Census and Economic Information Center.

Montana Department of Commerce. 2006. Economic News: *Personal Income, Money in Montanan's Pockets, Grows to $25.6 Billion* in Spring 2006 Newsletter. Volume 2. Issue 2.

Montana Department of Environmental Quality (DEQ). 2004. Understanding Energy in Montana – A Guide to Electricity, Natural Gas, Coal and Petroleum Produced and Consumed in Montana. October. Accessed on October 10, 2006. Online address: http://www.leg.mt.gov/content/publications/lepo/2005_deq_energy_report/introduction.pdf

DEQ. 2006a. "Montana Department of Environmental Quality website." Accessed on June 20, 2006. Online address: www.deq.state.mt.us/AirQuality/ARM_Permits

DEQ. 2006b. Major Facility Siting Program. Accessed on October 10, 2006. Online address: www.deq.mt.gov/mfs/index.asp

Montana Department of Labor and Industry. 2005. "Labor Market Information: Toole County." Online address: http://www.ourfactsyourfuture.org.

Montana Department of Labor and Industry. 2006. Montana Economy at a Glance: Economic Impacts of Federal Farm Subsidies. Prepared by Tyler Turner, Research and Analysis Bureau.

Montana Department of Revenue. 2004. "Biennial Report of the Department of Revenue July 1, 2002 to June 30, 2004." Online address: http://www.mt.gov/revenue/formsandresources/biennialreports/biennialreports.asp.

Montana Environmental Quality Council. 1972. "First Annual Report." Helena, MT.

Montana Fisheries Information System. 2005. "Fisheries Database." Accessed October 2005. Online address: http://maps2.nris.state.mt.us/scripts/esrimap.dll?name=MFISH&Cmd=INST

Montana Legislative Services. 2005. Montana Constitution, Article II. Montana Code Annotated 2005. Accessed on September 29, 2006. Online address: http://data.opi.state.mt.us/BILLS/mca/const/II/29.htm

Montana Natural Heritage Program (NHP). 2002. "List of Ecological Communities for Montana." Montana State Library. Helena, MT.

NHP. 2004. "Montana Animal Field Guide." Montana Natural Heritage Program, Helena, Montana. Accessed in September 2005. Online address: http://nhp.nris.state.mt.us/animalguide

NHP. 2005. "Montana Bird Distribution." Montana Natural Heritage Program, Helena, Montana. Online address: http://nhp.nris.state.mt.us/mbd

NHP. 2006a. *Northwest Glaciated Plains Community Field Guide*. Montana State Library. Helena, MT. Accessed on June 22. Online address: http://nhp.nris.mt.gov/community/ecosections.asp

NHP. 2006b. "Species of Concern." Montana State Library. Helena, MT. Accessed on June 26. Online address: http://nhp.nris.mt.gov/plants/index.asp

Montana Natural Resource Information System (NRIS). 2000. Topographically Integrated Geographic Encoding and Referencing System (TIGER). U.S. Census Bureau Information. Accessed October 2006.

Montana NRIS. 2005. "GIS Data." Accessed in September 2005. Online address: http://nris.mt.gov

Montana NRIS. 2006a. "GIS Data." Accessed multiple times in 2006. Online address: http://nris.mt.gov

Montana NRIS. 2006b. "DEQ Remediation Response Sites." Accessed June 2006. Online address: http://nris.mt.gov

Montana Noxious Weed Survey and Mapping. 1998. "Noxious Weed Distribution." Accessed on June 23, 2006. Online address: http://maps2.nris.mt.gov/mapper

Montana Partners in Flight (MPIF). 2000. "Bird Conservation Plan Montana Version 1.0." Accessed on June 30, 2006. Online address: http://biology.dbs.umt.edu/landbird/mbcp/mtpif/potholes.htm.

Montana State Engineer's Office. 1964. "Water Resources Survey: Chouteau County, Montana." State Engineer's Office, Helena, Montana.

Montana Water Resources Board. 1969. "Water Resources Survey: Liberty and Toole Counties." Montana Water Resources Board, Helena, Montana.

Mullen, Pat. 2006. Personal communication Pat Mullen, AMEC, Project Manager, with Nancy Linscott, Tetra Tech, Socioeconomist. July 24.

Mundinger, Everts and Mitchel. 2006. "A Guide to the Montana Environmental Policy Act." Revised 2006. Published by the Legislative Environmental Policy Office, Environmental Quality Council. Online address: http://leg.mt.gov/css/lepo/2005_2006/default.asp

Mussehl, T.W. and F.W. Howell. 1971. *Game Management in Montana*. Montana Department of Fish, Wildlife and Parks, Helena, Montana. 238 Pages.

N

National Institute of Environmental Health Sciences (NIEHS). 1999. Health Effects from Exposure to Power-line Frequency Electric and Magnetic Fields, Research Triangle Park, NC. June.

NIEHS. 2005. Electric and Magnetic Fields Associated with the Use of Electric Power, Questions and Answers, Exposure Standards. June. Online address: http://www.niehs.nih.gov/emfrapid/booklet/standard.htm

National Oceanic Atmospheric Administration (NOAA). 2006. "National Oceanic Atmospheric Administration website." Accessed on May 18, 2006. Online address: www.noaa.gov/climate.html

Natural Resources Conservation Service (NRCS). 2006a. Soil Survey Geographic (SSURGO) Data and National Soil Information System (NASIS) data. Online address: http://www.nris.mt.gov/nrcs/soils/

NRCS. 2006b. The PLANTS Database. National Plant Data Center, Baton Rouge, LA 70874-4490 USA. Accessed on June 22, 2006. Online address: http://plants.usda.gov

National Transportation Safety Board. 2006. "Aviation Accident Database and Synopses." Accessed on October 9, 2006. Online address: http://www.ntsb.gov/ntsb/query.asp

Nesser, J.A., G.L. Ford, C. Maynard, C. Lee, D.S. Page-Dumroese. 1997. "Ecological Units of the Northern Region: Subsections." General Technical Report INT-GTR-369. Ogden, UT. U. S. Department of Agriculture, Forest Service, Intermountain Research Station. 88 Pages.

North American Electric Reliability Corporation (NERC). 2007. Accessed in January 2007. Online address: http://www.nerc.com/

Northwest Economic Associates. 2003. "Accessing the Economic Development Impacts of Wind Power, Final Report." Prepared for the National Wind Coordinating Committee, Washington, D.C.

Northrup, R. 2006. Personal communication R. Northrup, Upland Game Coordinator, Montana Fish, Wildlife, and Parks with Stacy Pease, Tetra Tech biologist. October 17.

O

Oklahoma State University. 2005. Pondera County, Montana: Economic Impact of the Health Sector. Report prepared for the National Association of Counties Project, Oklahoma Extension Service and Oklahoma Office of Rural Health, Rural Health Policy and Research Center.

Olendorff, R.R., A.D. Miller, and R.N. Lehman. 1981. Suggested Practices for Raptor Protection on Power Lines. The State of the Art in 1981. Raptor Research Foundation, St. Paul, MN. Prepared for Edison Electric Institute, Washington, D.C.

Olson, G. 2005a. Personal communication G. Olson, Region 4 Game Biologist, Montana Fish, Wildlife, and Parks, Conrad, MT with Meghan Trainor-Fitch, AMEC Biologist. May 2.

Olson, G. 2005b. Personal communication G. Olson, Region 4 Game Biologist, Montana Fish, Wildlife, and Parks, Conrad, MT with Meghan Trainor-Fitch, AMEC Biologist. October 11.

P

Petersen, Jennifer, and David Ferguson. 2006. A Class I Cultural Resource Inventory of the Proposed Alberta-Montana Tie, Ltd. Power Line, Glacier, Toole, Pondera, Chouteau, Teton, and Cascade Counties, Montana. Prepared by GCM Services,

Inc. for AMEC Earth and Environmental, Helena, MT, and Alberta-Montana Tie, Ltd., Calgary, Alberta.

Pfister, Laura. 2007. E-mail communication from Laura Pfister, AMEC, to Pat Mullen, AMEC, January 18.

Q

R

Railton, John. 2006. "Email from John Railton, MATL Engineer, to Patrick Mullen, AMEC Project Manager, regarding transmission line firm shippers." August 29.

Redmond, R.L., M.M. Hart, J.C. Winne, W.A. Williams, P.C. Thornton, Z. Ma, C.M. Tobalske, M.M. Thornton, K.P. McLaughlin, T.P. Tady, F.B. Fisher, and S.W. Running. 1998. The Montana Gap Analysis Project: Final Report. Unpublished report. Montana Cooperative Wildlife Research Unit, University of Montana, Missoula. Accessed on September 12, 2006. Online address: http://ku.wru.umt.edu/report

Ringelman, J.K. 1992. "Waterfowl Management Handbook: Identifying the Factors that Limit Duck Production." U.S. Fish and Wildlife Service Leaflet 13.2.7.

S

Schultz, R.C., T.M. Isenhart, and J.P. Colletti. 1994. Riparian Buffer Systems in Crop and Rangelands. Agroforestry and Sustainable Systems: Symposium Proceedings. Fort Collins, CO. August. Accessed on June 23, 2006. Online address: http://www.unl.edu/nac/aug94/rip-crop.html.

Schwantes, Carlos Arnaldo. 1996. *The Pacific Northwest: An Interpretive History*. Revised and Enlarged Edition. University of Nebraska Press, Lincoln, Nebraska.

Scott, William S. 1980. "Economic effects of transmission towers on field crops in Ontario." Department of Transmission Environment, Ontario Hydro, Toronto, Ontario, CN. *Journal of Environmental Management*. 1981. Volume 12. Pages 187-193.

Simonetti, Barbara. 2006. *McCormick Ranch Wind Farm gets initial nod from commissioners, approval from residents.* Published in unknown regional newspaper. April 27.

Smith, Sherwin. 2006. Personal communication Sherwin Smith, Executive Director of the Teton County Farm Service Agency, Chouteau, MT, with Earl F. Griffith, P.G., Tetra Tech, Senior Scientist. July 5.

SNC-LAVALIN. 2006. Evaluation of Electric and Magnetic Field Effects MATL's 230-kV Power Line, Montana Alberta Tie Line. SNC-LAVALIN ATP Inc. Transmission Group. June.

Soil Science Society of America (SSSA). 1997. *Glossary of Soil Science Terms 1996*. Soil Science Society of America, Madison, Wisconsin.

State of Montana. 2005. Montana Code Annotated 2005: Weed and Pest Control Definitions. Accessed on June 23, 2006. Online address: http://data.opi.mt.gov/bills/mca/7/22/7-22-2101.htm.

Sterns, Rick. 2006. Personal communication Rick Sterns, Electrical Engineer Support Staff, Bonneville Power Administration with Keith Cron, Industrial Hygienist, Tetra Tech, Great Falls, Montana.

T

Thornton, Nancy. 2006. "Marketing Wind Energy Complex Process." *Chouteau Acantha*. August 31.

Tonbridge Power, Inc. 2007. Project Update, Helena, Montana. Power Point Presentation provided to the Montana Department of Environmental Quality on January 11.

Toole, K. Ross. 1959. *Montana: An Uncommon Land*. The University of Oklahoma Press, Norman, Oklahoma.

Toyota. 2006. "Toyota FAQ." Accessed on June 12, 2006. Online address: http://www.toyoland.com/faq.html

Tucson Electric Power Company. 2003. TEP Data Needs Meeting Minutes and follow-up materials provided by TEP; TEP, SWCA, and Tetra Tech, Tucson, Arizona, March 4.

U

U.S. Army Corps of Engineers (COE). 1987. "Corps of Engineers Wetlands Delineation Manual, Final Report." Prepared by: Environmental Laboratory, Waterways Experiment Station, Vicksburg, Mississippi. Technical Report Y-87-1.

COE. 2001. Legal Ruling from Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers.

U.S. Census Bureau. 2000a. "Population, Housing Units, Area, and Density: Montana. Census 2000 Summary File." Online address: http://www.factfinder.census.gov.

U.S. Census Bureau. 2000b. Table 41. American Indian and Alaska Native Alone and Alone or in Combination Population by Tribe for Montana: 2000.

U.S. Census Bureau. 2005a. Table 4. Annual Estimates of the Population for Incorporated Places in Montana, Listed Alphabetically: April 1, 2000 to July 1, 2004 (SUB-EST2004-04-30). Population Division. June 30.

U.S. Census Bureau. 2005b. Small Area Income and Poverty Estimates. Updated December 7.

U.S. Census Bureau. 2006. Table 1. Annual Estimates of the Population for Counties of Montana: April 1, 2000 to July 1, 2005 (CO-EST2005-01-30). Population Division, March 16.

U.S. Department of Agriculture (USDA). 2004. Table 8. Farms, Land in Farms, Value of Land and Buildings and Land Use: 2002 and 1997. National Agricultural Statistical Service, Census of Agriculture – County data. Accessed in June 2006. Online address: www.nass.usda.gov/census/census02/volume1/mt/MTVolume104.pdf.

USDA. 2006. County-level Unemployment and Median Household Income for Montana. Bureau of Labor Statistics. Updated April 2006.

USDA Forest Service. 1994. Ecological Subregions of the United States. Complied by W. Henry McNab and Peter F. Avers. WO-WSA-5. Accessed at: http://www.fs.fed.us/land/pubs/ecoregions/ch41.html#331E. June 23, 2006.

USDA – Rural Utility Services and DEQ. 2007. Final Environmental Impact Statement, Highwood Generating Station. January.

U.S. Department of Commerce. 2006. "Per Capita Personal Income, 2004." Montana. Regional Economic Information System, Bureau of Economic Analysis. April 25.

U.S. Department of Energy (DOE). 1986. Conrad-Shelby Transmission Line Project, Draft Environmental Impact Statement.

DOE. 2001. Sundance Energy Project Draft Environmental Impact Statement. DOE/EIS-0322, U.S. Department of Energy. Washington, D.C. March.

U.S. Department of Housing and Urban Development (HUD). 2001. *The Noise Guidebook*. Washington, D.C. August 20 2004.

U.S. Department of Interior Bureau of Land Management and Montana Department of Environmental Quality. 1996. Express Crude Oil Pipeline Final Environmental Impact Statement.

U.S. Department of Interior Bureau of Land Management (BLM) 2005. BLM Wind Energy Development on BLM Lands in the Western U.S. Programmatic EIS. Online address: http://windeis.al.gov/

U.S. Department of Interior, Fish and Wildlife Service (FWS). 2006. "National Wetland Inventory map information for downloading." Accessed June 23, 2006. Online address: http://wetlandsfws.er.usgs.gov/

U.S. Department of Labor, Bureau of Labor Statistics. 2005. Accessed in June 2006. Online address: http://www.bls.gov

U.S. Environmental Protection Agency (EPA). 1978. Protective Noise Levels (Condensed Version of EPS Levels Document). November. (PB82-138827).

EPA. 2006a. "U.S. Environmental Protection Agency website." Accessed on June 20, 2006. Online address: www.epa.gov/air/airtrends/factbook.html

EPA. 2006b. " U.S. Environmental Protection Agency website." Accessed on June 20, 2006. Online address: www.epa.gov/natllibra/core/envlaw.htm

EPA. 2006c. "Region 8 Superfund." Accessed in June 2006. Online address: www.epa.gov/region8/superfund

U.S. Fish and Wildlife Service (FWS). 2000. "Benton Lake National Wildlife Refuge, Wildlife List." October.

FWS. 2006. National Wetlands Inventory Data. Online address: http://www.fws.gov/nwi/

U.S. Geological Survey (USGS). 2006a. "USGS Subbasins (4th Field HUCs)." Online address: http://www.icbemp.gov/

USGS. 2006b. "Earthquake Hazards Program." Online address: http://earthquake.usgs.gov.research/hazmaps/

USGS. 2006c. "Surface Water Data." Accessed in June 2006. Online address: http://waterdata.usgs.gov/mt/nwis/sw

V

VandenBos, Jared. 2006. GIS and Mapping Technician with Compton Signatures personal communication with Keith Cron, Industrial Hygienist, Tetra Tech, Great Falls, Montana.

Verbund. 2006. "Underground 380 kV Lines: European Grid Operators Make Their Position Clear." Accessed on November 9, 2006. Online address: http://www.verbund.at/en/apg

W

Walker, Deward E. and Roderick Sprague. 1998. "History Until 1846." In *Plateau*, edited by Deward E. Walker, Pages 138 through 148. *Handbook of North American Indians*. Volume 12. W. C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Waveguide 2003. "Average Exposure from Common Appliances." Accessed in June. Online address: http://waveguide.org/archives/waveguide_3/exposure.html

Western Area Power Administration (WAPA). 2001. Western Area Power Administration, Construction Standards, Standard 13. Environmental Quality Protection. October.

Western Electricity Coordinating Council (WECC). 2007. Accessed in January 2007. Online address: http://www.wecc.biz/

Western Regional Climate Center (WRCC). 2006. "Western Regional Climate Center website." Accessed on June 20, 2006. Online address: www.wrcc.dri.edu

Williams, Bob. 2006. Personal communication with Mr. Jeff Blend, Montana Department of Environmental Quality, Economist, and Mr. Bob Williams, Vice President, MATL Regulatory. June.

Williams, Bob. 2007. Letter from Bob Williams, Vice President, MATL Regulatory, to Warren McCullough, Bureau Chief, Montana Department of Environmental Quality. January 26.

Woods, Alan J., James M. Omernik, John A. Nesser, J. Shelden, J.A. Comstock, and Sandra H. Azevedo. 2002. Ecoregions of Montana. Second edition (color poster with map, descriptive text, summary tables, and photographs). Map scale 1:1,500,000. Accessed on June 22, 2006. Online address: http://www.epa.gov/wed/pages/ecoregions/mt_eco.htm

X

Y

Yeagley, Jim. 2006. Personal communication Jim Yeagley, Contract Land Use Planner for Glacier, Toole, and Pondera counties, with AMEC Earth and Environmental. August 23, 2005.

Z

Zelenak, J.R. 1996. "Breeding Ecology of Ferruginous Hawks at Kevin Rim in Northern Montana." Master Thesis, Montana State University. Bozeman, Montana. 74 Pages.